Scientific Agriculture

La Revue Agronomique Canadienne

VOL. IV. OTTAWA, ONT., APRIL, 1924. NO. 8

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Published Monthly by the Canadian Society of Technical Agriculturists.

Forms close on the 23rd day of each month; all copy for advertisements, and changes of advertisements, should be received ten days before the date of issue.

All correspondence should be addressed "Scientific Agriculture, P. O. Box 625, Ottawa, Ont."

Cheques, money orders, etc., must be made payable to the order of the Canadian Society of Technical Agriculturists (C.S.T.A.)

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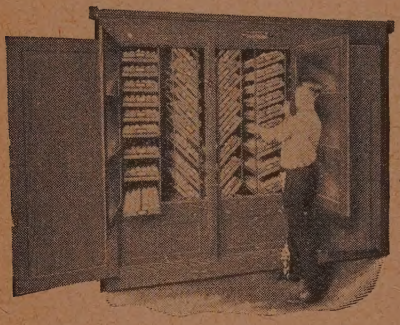

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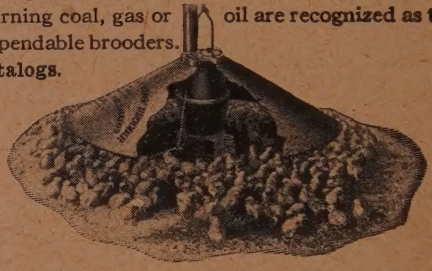

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The Responsibility of the Universities Towards Agriculture.[1]

ROBERT NEWTON

University of Alberta, Edmonton.

I suppose one might generalize to the extent of saying that where there is a problem, there the university has a responsibility. A problem implies a need for a solution, and a solution generally requires research. The university is looked upon not only as the natural home of research, but also as the training ground of research workers. So then my subject divides itself naturally into these aspects: the problems of agriculture and methods for their attack, and educational policies with respect to the training and use of the man-power required. Naturally I shall have to limit the scope of my treatment of these phases, having regard to the time at my disposal and also to my acquaintance with the subject.

I shall begin by setting up the self-evident proposition that if a fight for food is not to become the dominant issue of life, the food supply of the earth must increase with its population. This fact is in itself a sufficient justification for all agricultural research.

The average person, of course, never thinks of a population problem, or if he thinks of it at all, it is merely from the point of view of the real estate agent, to whom our vast open spaces are just so many potential 50 x 100-foot lots, capable of accommodating any number of people. Another class of thinkers, however, view with increasing alarm the rate at which our world population is overtaking our capacity to support them properly. China, for example, has increased from 150 millions to 400 millions of people in the last 200 years. The enormous growth of the population of the United States in the last hundred years is well known to all of you.

No doubt some of you have read a recent book by E. M. East, entitled "Mankind at the Cross Roads." East is an agriculturist by profession, and discusses the food-supply aspects of the population problem at considerable length. Some of his conclusions are:

"That temperate Europe and Asia taken as a whole are overpopulated. Only Russia can take care of many more people. . . . The European countries are increasing rapidly (in population), not because they have more room in their home lands, but because industrial expansion permits it through the fact that there have been and still are undermanned countries suitable for extensive agriculture, giving large returns per capita, though small returns per unit of land." (Such countries have a surplus for export to over-populated countries). "These countries are North America north of the Rio Grande, the lower parts of South America and Africa, and Australia and New Zealand."

The United States, East points out, has passed the era of great expansion in agricultural production (expansion due to the continual opening up of new farm lands), and has entered the era of diminishing returns, on the basis of present methods. The development of a permanent agriculture, on the basis of methods which prevent a deterioration in soil fertility, will not make it possible, East believes, for the United States to support a population greater than 150 to 200 millions at the standard of living which the country now enjoys. If East is right, the food exports of the United States, which are now rapidly declining, must be expected quite shortly to reach the vanishing point.

A paper pointing out the impending danger of a world food shortage was read by R. A. Gortner, of the University of Minnesota, at the Cincinnati meeting of the A.A.A.S., just past. He explained that with the growth of population so rapidly overtaking production for man's subsistence, it cannot be more than a few generations until the world will have more mouths than it can feed, unless something is done to increase the resources of agriculture.

[1] An address to the Faculty Club, University of Saskatchewan, February 7, 1924.

The spectre of starvation is not an invention of modern science. The Rev. T. R. Malthus, a noted English political economist, at the beginning of the 19th century advanced the view that population tends to increase faster than its food supply can be made to do, and that unless increase in population can be restricted, poverty and suffering is inevitable.

The Great War opened our eyes to some facts which had hitherto escaped us, or at least had failed to impress us. The world is absolutely dependent on its harvests from year to year. In August we are but a few months from starvation. In Britain the reserve food supply is sufficient for only about three weeks, a fact which seemed grim and real enough in the face of the submarine menace.

The Great War likewise taught us that the mobilization of the forces of science was at least as important as the mobilization of our armies, in enabling us to hold together through such an unexampled period of stress. The scientific research of that period was largely designed, it is true, to make possible the perfection of implements of greater destruction, but grim necessity compelled us to attend also to that designed to save the economic and social fabric of the nation. Agricultural products were recognized to be not less essential than munitions of war.

We have no reason to doubt the efficacy of science in meeting any material exigency of the future; but it must be given a fair chance, and not treated merely as something to fall back upon in an emergency, and disregarded at other times.

Perhaps most writers on the population problem have been chiefly concerned with the question of restricting its increase. In this paper, however, I am concerned only with the aspect of food supply.

There are scientists now working on the problem of the artificial synthesis of foods, who are trying to solve the mechanism by which plants transform light energy into chemical energy, the light of the sun into the carbohydrates and proteins which the animal body requires for its sustenance. If man should ever become completely master of this secret so that he could reproduce the proper conditions at will, it would appear to open up new and unlimited food resources to him. But such a triumph is probably a long way in the future. That, however, is no cause for immediate discouragement, as we have by no means exhausted the possibilities for expanding the productive capacity of agriculture by the application of science. We have, indeed, scarcely dug below the surface as yet, and the little we have accomplished has been so wonderfully fruitful as to give us unbounded confidence in the possibility of greater achievement in the future. But, as I shall try to show, success cannot be expected without hard work. Progress is dependent upon research, and the responsibility for leadership in this connection naturally rests upon the Universities.

Wheat is the staple food crop of our western civilization, and the wheat crop has always been a prime object of solicitude to those who seek to improve agriculture. As an illustration of the kind of problem which we are now facing, let us consider the history of the wheat yield of England. During the Manorial period the average yield is variously estimated to have been from 6 to 10 bushels per acre. As the open-field system of farming then in vogue would lead to soil exhaustion, the yields are perhaps comparable to that of the continuous culture plot at Rothamsted, where wheat has been grown on the same plot every year for three-quarters of a century, without the addition of any fertilizer. The average yield of this plot has remained constant for many years at 12 bushels. It must be remembered, however, that it receives careful tillage and weeding every year, so that it is not surprising to find the relatively neglected fields of the Manorial period remaining constant at some bushels less than this figure for a period of 300 years. But this state of things ended with the 17th century, and from 1699 to 1882, the average yield increased gradually and steadily to about 30 bushels. From 1882 to 1922, however, there has been no noteworthy increase! This is not only astonishing, but also decidedly sobering. The improvement from 1699 to 1882 was due mainly to two factors: improved tillage and improved varieties. Unless tillage methods have fallen off in the last forty years, a thing we have no reason to suppose, it seems necessary to conclude that the great efforts for the further

improvement of varieties put forward during that period have not been attended by marked success.

The outlook is not so hopeless, however, as the last statement might lead one at first sight to believe. What it means is simply that the limit of improvement in yield of the English wheat crop *with the methods and knowledge now available* appears to have been nearly reached.[2] But so far only the more obvious factors limiting the yield of this crop have been studied and manipulated. The more or less superficial methods for improvement evolved in this way were abundantly fruitful for a time, but a point has been reached where the law of diminishing returns becomes actively operative, and further great progress must wait upon new methods to be evolved as a result of thoroughgoing and elaborate investigation. It is a pleasure to record in passing that our British colleagues are fully seized of this point, and with the financial assistance of the British Government, have under way at the various universities a sound and comprehensive programme of research looking toward that end.[3]

It is quite true that in Canada our farms on the average are not nearly so well tilled as in England, and there is still much room for improvement in general farm practice with the knowledge already at our disposal. That is not to say, however, that we are not in need of investigation even in matters of tillage. For example, who can say with certainty what system of cultivation and crop rotation will enable us to make the best and most economical use of that most important fertility factor in the Prairie Provinces, our soil moisture supply? No one.

In crops we are at least as lacking as they are in England in that fundamental knowledge prerequisite to great future progress in plant improvement. Thus far, however, we have not profited by their good example in making a concerted attack upon the problem.

The problems of agriculture may be considered from two points of view, that of the man who is farming as a profession and is chiefly concerned with the welfare of his own group, and that of the economist who looks upon agriculture as an institution for the production of the world's food supply. The latter is the point of view of this paper, though there is no fundamental antagonism between the two points of view. It is in the ultimate interest of all to have maximum production at cheapest cost. To achieve this result we must bring to bear all the productive factors at our disposal, and eliminate so far as possible all the leaks, wastage, and losses of various kinds.

This is not the place to make a detailed enumeration of the problems of agriculture, or a lengthy discussion of methods for their attack. But if you will allow me, I shall attempt to classify briefly the factors which govern crop production, and indicate a few of the problems growing out of them, in order to illustrate more fully the kind of research which I believe agriculture calls for at the present time.

We may group these factors under five headings: (1) climate, (2) soil, (3) cultural methods, (4) disease, insects, weeds and other sources of loss, (5) botanical and physiological characters of our crop plants.

Climate and soil are given to us by Nature. We may perhaps change them slightly, but not very much. It is important that we recognize that these are key factors, so dominating the whole question that we cannot hope to revolutionize agriculture like cotton spinning or steel making. But if we cannot attack the problems of climate and soil directly, we can do so indirectly through the factors included in the further categories of our classification, namely, category (3), cultural methods, and category (5), the botanical and physiological characters of our crop plants. Cultural methods are almost entirely within our control, and plant forms, as we come to understand them, are generally found to be surprisingly plastic in the hands of the plant breeder. So then if the mountain will not come to Mahomet, Ma-

[2] The relative constancy of wheat yield during the last forty years is, of course, not conclusive evidence of the bankruptcy of our improvement methods, since other factors may have been operative.

[3] An interesting popular account of agricultural research in Great Britain since the war will be found in "Agricultural Research and the Farmer", by V. E. Wilkins, Ministry of Agriculture and Fisheries, 1922.

homet must perforce go to the mountain. In a word, if we cannot change climate and soil to suit our convenience, we must adapt our cultural methods and plant forms to suit our soil and climate.

But a world of investigation is required before we can hope to do this with any degree of completeness. It will occur to you at once, for example, that if we are to undertake the modification of our plant forms, with a view to fitting them into their environment more satisfactorily, we must first acquire an understanding of how the various factors of the environment act upon the plant, and what is the relative effect of each upon our crop yields. We have no such complete knowledge for any plant form, but the great advances made possible by the acquisition of even a limited knowledge of the effect of such factors as light, temperature and moisture give us an inkling of the latent possibilities of this little explored field.

Perhaps the most hopeful sign of our times, from the point of view of agricultural science, is that we realize the complexity of the problems which confront us, and the far-reaching nature of the research work we must undertake if we are to unravel the tangle, to resolve complex factors into simple components which can be brought under control.

Some eighty years ago the soil was regarded as a simple reservoir of plant food, the capabilities of which for crop production could be completely determined by chemical analysis. When such a delightfully simple conception was found untenable, mechanical analysis was resorted to, on the assumption that differences in fertility might be due to physical properties. Still the problem proved refractory, and a solution was looked for next in soil biology. Happily we have reached the stage when we no longer think of soil fertility as limited by any one factor or set of factors, but as the expression of a highly complex series of interacting factors. It is the difficult task of the soil investigator to elucidate these, and so to integrate with them our cultural methods that we may obtain the greatest possible advantage from our natural inheritance.

When we come to group (4) in our classification of factors governing crop production, namely, losses due to disease, insects and weeds, we find again that these can best be overcome through the medium of the factors included in categories (3) and (5), cultural methods and the botanical and physiological characters of our crop plants. We must develop tillage methods which control, and plants which are resistant or immune to these pests. If we have any doubt as to the magnitude of the problem presented by these factors of loss, it will be quickly dispelled by the consideration of one or two examples.

Dr. Robert Magill, secretary of the Winnipeg Grain Exchange, if reported correctly by the press, estimated the loss to farmers of Manitoba and Saskatchewan from the ravages of perennial sow thistle last year at the enormous sum of $70,000,000.

The loss from wheat stem rust in Manitoba alone last year has been estimated at $20,000,000. Saskatchewan also suffered seriously, and Alberta to a considerable extent.

Now if we could only discover a brand of rust which is specific and fatal to sow thistle, the conjunction would be a most happy one! Perhaps the idea is not so far-fetched as it sounds. Biological methods for the control of pests (by the introduction of insect and fungoid parasites) have been successfully applied in some cases, and the possibilities of this method deserve to be thoroughly canvassed.

But if the benefits to be derived by exploration along this line may be somewhat speculative in their nature, the same is not true of the vast *terra incognita* represented by the factors limiting crop production which I have grouped in category (5), botanical and physiological characters of our crop plants. I know of no field of research which offers greater promise of fruitfulness in additions to knowledge which may subsequently be turned to practical account.

What do we know of the nature of plant adaptations, the botanical and physiological characters which render the plant capable of making the best use of the resources of its environment, and of resisting unfavorable conditions, such as frost, drought and disease? I could reply, "Practically nothing,"

and be not far from the truth. We have discovered, by planting different varieties in plots side by side and making observations, that some will stand drought better than others, that some varieties of winter crops will over-winter more successfully than others, that some varieties of wheat are more resistant than others to stem rust. This is the time-honoured method of selecting superior sorts; it has been the means of great progress in the past, and we shall never be able to dispense with it. But of itself, without the support of more fundamental investigation, it does not promise to be adequate for future needs. In one case at least which we have noticed, that of the wheat crop of England, it is beginning to exhibit disturbing symptoms of having outlived its usefulness. The weak point of the method is that it tells us little or nothing of the fundamental nature of the qualities we desire in our crops.

Perhaps we do not all realize fully that the plant breeder is now in about the position the chemist would occupy if there were no such thing as laboratory glassware, and he were obliged to carry out all his reactions in opaque vessels. The intimate nature and course of the complex biological reactions in which the plant breeder deals are entirely hidden from him. I do not wish to minimize the importance of the excellent work that is being done on the physical basis of heredity. What I have in mind is rather the morphological, physiological, and chemical expression of the hereditary characters of the plant, in relation to such things as fungous enemies, as well as to its soil and climatic environment—those key factors about which we must fit everything else.

The immediate value of plant breeding needs no argument; the gain from the introduction of a superior sort like Marquis wheat appeals to the least scientifically minded. But how greatly might progress be accelerated if the nature of the qualities for which plant breeders are working were well understood, and purely empirical methods were no longer necessary?

The complex qualities I have mentioned—drought resistance, frost resistance, disease resistance—together with many others, go to make up that vastly more complex quality called high-yielding capacity. What we must do is to resolve yielding capacity into its unit factors, or biological characters. We must do the same thing in the case of special qualities which we desire, such as milling and baking quality in wheat. Next we must find out how these characters are inherited. Then we shall be ready for the next great era of progress in plant breeding, the synthetic era, when by scientific hybridization we shall build new forms combining the desirable characters we have discovered.

This combination of desirable characters by hybridization is, of course, not a new idea. We have long been in the habit of doing such things as crossing a high-yielding variety with a strong-strawed variety, in the hope of combining both these qualities in the progeny. But the advance will be in our more complete and exact knowledge of what are desirable characters. Our future progress in the improvement of crop plants will be measured by our success in attaining such knowledge.

Let me give you just two examples of the way in which research along this line has been turned immediately to practical account. (1). The awns or beards of barley are objectionable on account of their roughly barbed character. Plant breeders tried for a generation to produce a high-yielding awnless barley, without success. Finally in a purely scientific investigation it was discovered that the awns were important organs of transpiration, and that it was a physiological impossibility to remove the awns without reducing the yield. Plant breeders then turned their attention to smooth-awned barley, with more hope of success. Incidentally, this raises the question as to what possibilities of higher-yielding wheat varieties we may have missed by persistently discarding all bearded types. (2). Plants are the one ultimate source of the food supply of the world. They occupy this unique position by virtue of their power to transform the radiant energy of the sun into chemical energy in the form of carbohydrates and proteins, the essential foods of the animal body. The chlorophyll, or green coloring matter, of the plant is an indispensable agent in this transformation. Now plants in general are very inefficient transformers, using only about 0.5 percent of the radiant energy falling upon their leaves. But it has been shown in the case of corn that

some strains are more efficient than others, by reason of a greater content of chlorophyll, and that this superiority is inherited and can be controlled by plant breeding. The practical possibilities growing out of such a fundamental discovery need hardly be pointed out.

I am confining myself chiefly to the problems of crop production, because in that field I am more at home. However, when one approaches the field of animal production, there are problems obvious enough to be perceived at once even by the uninitiated, and perhaps I may be permitted just to mention one or two.

It seems to me one is first struck with the exceedingly wasteful nature of the process of converting plant products to animal products. The late Dr. C. G. Hopkins is authority for the statement that 1,000 bushels of grain has at least five times the food value, and will support five times as many people as will the meat or milk that can be made from it. For every 100 pounds of dry substance eaten by cattle we get 4 pounds returned in edible portions of the carcase. The crowded population of China has largely adopted vegetarianism as the remedy for this situation, but the peoples of our western lands do not take kindly to such an idea. Dr. Hopkins states that of the 100 lbs. dry substance eaten by the cattle, 36.5 lbs. are left in the excrements as waste. Surely studies in animal nutrition will show us how to effect great economies by adjusting rations more nicely to the animal's requirements.

Another problem of animal production which strikes the lay reader very forcibly is the enormous wastage due to disease. Only lately we have been reading of the wholesale slaughter of cattle in England due to an outbreak of foot-and-mouth disease. Not so spectacular as these sudden epidemics, but even more serious in the heavy annual losses which they occasion, are the insidious inroads of diseases to which we have become so accustomed as to take them almost as a matter of course. It is a costly sort of contempt which is engendered by such familiarity, from which our only hope of escape is by the way of investigation. Triumphs such as anthrax vaccine and hog cholera serum give us confidence in the ultimate adequacy of science, provided always it is given a fair opportunity.

My initial proposition was that the food resources of the world must be increased if a struggle for existence is not to ensue in the not distant future. I trust I may not have obscured it by an over-technical discussion of some of the problems involved. What I have sought to show is that the carrying out of this proposition involves an extension of our present knowledge which can be acquired only by the most elaborate fundamental research. The whole responsibility for this cannot be shouldered by our universities, but it is not too much to expect that they should assume their natural position of leadership in the matter. Above all, it is to be hoped that the very magnitude of the programme involved will not deter them from making a beginning.

When the question of fundamental research in agriculture has been approached, there has been a tendency, at least in some quarters, to take the attitude that we are in Canada too much occupied with practical problems to have time for the investigation of principles, and to say in regard to research, "Let George do it"—"George" in this case being the United States and Europe. Certainly in a new country, practical problems may legitimately demand first consideration, but we have found that even in the case of the most practical of these problems—take, for example, such an apparently simple and straightforward one as the determination of the best dates of seeding for corn and sunflowers—a complete solution may elude us until we investigate the underlying principles.

Those who take the selfish attitude that since principles are the same everywhere we have nothing to lose and everything to gain by letting someone else work them out without expense to us, would do well to ponder the lessons of history. In one of his presidential addresses to the Royal Society, Sir Wm. Huggins pointed out that with the founding of the National Physico-technical Institute of Berlin, five years in advance of the establishment of the National Physical Laboratory of England (1902), the renown which was formerly England's in exact scientific measurements, and for the construction of

standards and instruments of precision, passed to Germany. If we are content to see the superiority in agricultural matters, with regard both to quality and quantity of production and prosperity of the people, pass to the United States, we have only to neglect agricultural research.

This aspect of the question was well summed up by Sir David Orme Masson, in his presidential address to the Pan-Pacific Science Congress, held in Australia last year. He said: "Every civilized nation owes a duty to the others to do a share of the work that is essential for the world's intellectual, material, and moral progress. Nothing but extreme poverty or youthful irresponsibility could excuse a nation which, shirking this sacred duty, elected selfishly to profit only by foreign-made science; and nothing is more certain than that it would profit not at all, for it would fail through sheer inability to understand."

The universities, as I have said, must accept the responsibility for leadership in this matter. It is our duty not only to deal in teaching with the accumulated mass of knowledge, but not less to contribute by research to the growth of that knowledge.

The question of the kind of training which should be given to students in our agricultural faculties nearly always provokes discussion. Some take the view that it should be made as practical as possible, in order to turn out men who are able technicians, competent to run a farm themselves or to act in an advisory capacity to farmers. Others hold that the student should be trained as a true scientist. To me the rational plan is to devise a curriculum sufficiently elastic to provide for the training of both types of men. But at least I must urge that while we are faced with such a need for scientific research in agriculture, it would be suicidal to deny to students with an aptitude for science the opportunity to develop their powers. The London Times, commenting editorially on the programme of the recent Liverpool meeting of the British Association for the Advancement of Science, remarked of the agricultural section, (as of some other sections of this organization) that it was "apt to attract communications which sat uneasily in the category of science." Those of us who are familiar with the work now being published by our British colleagues must realize that if this be true of them, hardly may we hope to escape the same condemnation. Knowing our need of science, we must realize further that if it be true, it is a deficiency which we must seek with all haste to repair. Only highly trained and skilful workers can hope to make progress in solving the present problems of agriculture, and it is to the Universities that we must look for men of this type.

There is one important aspect of this problem which is frequently neglected: that is, the conservation and efficient utilization of men who have proved themselves to be capable and productive research workers. Sir Ronald Ross, in a recent address to the British Science Guild, made the plain statement that Britain is throwing her genius on the dust heap. Unfortunately we can point to instances of the same sort of thing in Canada. I shall take the liberty of mentioning only one. Dr. Charles Saunders, a man who gave us a number of valuable new varieties of cereals—it is only necessary to mention Marquis wheat, with its 1923 crop in America valued at a billion dollars—in his self-styled valedictory message to agriculture, made the following statement: "The conditions under which I have worked have been growing steadily less and less favourable for a long time. My best efforts to bring about improvements have been fruitless, so that at last I find myself with no choice but to retire from my position."

The case of Dr. Saunders is "another of those mysteries," to quote Maurice Longstreth, "which for lack of printable adjectives we can only call governmental." It is fair to add, however, that a democratic government can only reflect the ideas of the people it represents; in the long run the responsibility falls upon all of us.

The quotation from Dr. Saunders, besides drawing attention to an appalling state of affairs, also gives us the clue to its remedy. The most satisfactory reward to a man of science is to have conditions made so that he can carry on his work to advantage. He has no aspirations to a baseball salary, but he does hope for good equipment and capable assistance, by which he may extend and

improve his work, free from non-technical criticism and the blighting touch of the efficiency expert. These drive him to produce hypothetical balance sheets and to advertise himself, things so antagonistic to the spirit of true research that it cannot live in their presence. One distinguished research worker admitted that most of his inspirations came while he was shaving in the morning. No doubt an efficiency expert would recommend in this case that he shave by the clock several times a day!

The idea of the older men, that a scholar should retire from the world, and in the seclusion of the academic grove and cloister, devote himself to the pure quest of truth, was right at least in principle. The scientific worker must be allowed the privilege of retirement and peace in large measure, if he is to succeed in penetrating the closely guarded secrets of Nature; and he himself must be the judge of when his discoveries are ready for publication to the world. Such conditions are, as a rule, more easily approximated in a university than in a government department. So it is that the universities always have been and, we trust, always will be leaders in research.

In Canada, fundamental research in agriculture has thus far been relatively neglected. The challenge to our universities (and, I should add, to those who are responsible for their financial support) is becoming more insistent. Let us hope they may rise to their responsibility, and add works to faith that future generations may not ask in vain for bread.

Longevity of Alfalfa and Clover Seeds.

G. P. McROSTIE

Dominion Agrostologist, Experimental Farm, Ottawa, Ont.

When the writer took over the forage crop breeding work at Macdonald College in the fall of 1920, he found a considerable stock of old packages of red clover, alsike clover and alfalfa seeds. These had all been stored under dry and reasonably warm conditions. In most cases the container was either a small cotton sack or a manilla paper envelope. On the whole the storage conditions would be classed as better than the average conditions under which such seeds are stored commercially but about the average for material used for experimental purposes.

This seed afforded opportunity for securing a little additional data on the longevity of certain alfalfa and clover seeds and was consequently used for that purpose.

The bulk of the seed was of red clover but alsike clover and alfalfa were also represented. Ten year old seed of all three types was obtained as well as varying amounts of seed of fewer years storage.

Duplicate one hundred seed samples were taken from each lot, and the results figured on the average of the two samples tested. An electric germinator with thermostat control was used and the different seeds germinated at the optimum germination temperature for the kind of seed under test. Small compartment trays, each compartment containing moist blotting paper were used for holding the seed. The seed was placed between the moist layers of blotting paper and kept as far as possible under uniform moisture conditions during the whole period of germination.

The relative longevity of dark versus light seeds of red clover has been under discussion for a long time, consequently in lots having sufficient seed of both kinds the dark and light seeds were separated and duplicate samples taken of each sort. The germinations of the dark and light seeds, where such were separated out in any lot, are recorded in different columns in the included table giving the germination of red clover seeds.

An attempt was made to secure seed of different ages from various commercial seed

firms. With very few exceptions this attempt met with failure as few seedsmen keep samples more than two or three years and of course do not under ordinary circumstances sell to the growers seed over this age. At any rate it would not be policy for a seedsman to admit having on hand or selling old seed even though the germination might still be sufficiently good to justify him in so doing.

The following tables give in condensed form the average germination of the different lots tested in the various years.

TABLE I—GERMINATION TEST WITH RED CLOVER SEED

No. of Lots Tested	From Seed Crop of	Years Old	Yellow Seeds		Purplish Seeds		Bulk Seed Av. Germination	Range of Germination
			Av. Germination	Range of Germination	Av. Germination	Range of Germination		
16	1911	10	43.7	38-55	46.8	37-75	...	..-..
27	1912	9	65.9	60-75	71.6	64-80	68.8	62-74
2	1913	8	75	..-..	79	..-..	...	..-..
19	1914	7	75	65-81	80.1	65-94	...	..-..
18	1915	6	....	..-..	...	..-..	80.19	73-92
70	1916	5	75.5	60-93	88.5	80-99	89.38	80-99
48	1918	3	98.3	95-100	98.4	94-100	95.3	90-100
36	1919	2	93.7	84-100	94.9	91-100	97.2	90-100

TABLE III—GERMINATION TESTS WITH ALFALFA SEED.

No of Lots Tested	From Seed Crop of	Years Old	BULK SEED	
			Av. Germination	Range of Germination
3	1911	10	40.3	37-44
* 3	1916	5	92.3	89-96
16	1917	4	86.4	78-94
9	1918	3	90.2	82-98
9	1919	2	91.5	82--100

* 3 lots from the same source and of same strain.

TABLE II—GERMINATION TESTS WITH ALSIKE CLOVER SEED

No of Lots Tested	From Seed Crop of	Years Old	BULK SEED	
			Av. Germination	Range of Germination
6	1911	10	46.99	41-64
3	1912	9	45.3	40-50
* 3	1914	7	36.0	32-41
9	1918	3	88.7	81-97
9	1919	2	97.6	92-100

* Secured through a local seed house at time of test, consequently not kept under identical conditions to other sample.

In examining the data in the included tables of germination it is well to keep in mind that such a germination test is rather a check on the viability of the seed in question than a proof of its ability to produce vigorous plants. However, only seeds showing reasonably vigorous germination were included in the reported results, hence such results might be expected to give a fair indication of the reproductive value of the seeds in question.

Two and three year old seeds in all lots of red clover and alfalfa gave an average germination equal to that of average new seed. In the case of three years old alsike clover seed the germination fell down below ninety percent but not lower than is quite frequently found in commercial lots of year old seed that have not been first quality to begin with.

An interesting feature of the test is the amount of germinable seeds present in the ten year old samples of alfalfa and clovers. This would indicate that it is quite possible to guard against the loss of any strain of the crops, the seeds of which were included in this test, even when such tests extend over a considerable period of years as happens in longevity tests, especially with alfalfa. Any plant that is able to withstand the range of climatic variations extending over any period of ten years stands a good chance of not having its further existence cut short by any idosyncrasties of the weather man.

In the case of the relative longevity of the yellow and purplish red clover seeds the records in Table I indicate that the yellow seeds loose their vitality slightly faster than the purplish seeds after the third or fourth year. The difference between the two however is not sufficient to warrant any serious discrimination one way or the other as far as their relative value is concerned.

The rapid falling off in germination in all samples of alfalfa and red clover, after the ninth year would indicate that they were rapidly approaching the limit of storage in a viable condition.

The fairly wide range in germination of the different lots of seed may indicate one of two things. Either there has been some small variation in storage or germination conditions which has resulted in decreased or increased germination of some samples or else considerable variation in inherent tendency to longevity of seed exists in strains of clover and alfalfa. It seems quite possible that both of these conditions exist. Following through the germination in succeeding years storage of the seed of certain strains of alfalfa and red clover a well marked tendency is noticeable in different generations of certain strains towards longevity. The practical value of a strain of alfalfa or clover the seeds of which possessed to a marked degree the quality of longevity is doubtful from the standpoint of the seedsman. It would be interesting and of some value however, to the plant breeders to know whether or not longevity of seed was correlated with longevity of the plant on which the seed was produced.

Preliminary Investigations on the Root-Rot and Blight of Canning Peas.

R. E. STONE

Associate Professor of Botany, Ontario Agricultural College, Guelph.

In certain sections the growing of canners peas is an important industry. In these sections the farmers and seed growers have sustained much loss from a serious pea disease. To the growers this disease is commonly known as blight, a name loosely applied to any trouble that results in the greater or less destruction of plants previous to the formation of the fruit. In this Province the blight of canners peas is closely correlated with a characteristic root-rot, so possibly it will be better to use the term root-rot in order to differentiate the particular disease which is under investigation.

In the eastern sections of Ontario, especially in Prince Edward County, the root-rot and blight has been a serious handicap for many years. Some farmers have been forced to give up pea-growing entirely or to abandon this crop for several years. Frequently a whole field of peas will die down just about flowering time and produce less seed than originally sown, from other fields perhaps half a crop will be harvested. From these extreme conditions there are all gradations down to fields in which only a few scattering plants show the blight. As a rule the root rot and blight is worse in fields that have grown many crops of peas though it sometimes appears suddenly. Generally the blight first shows on a few plants or in small patches in the field, then with each succeeding crop the infested areas rapidly become larger until the whole field is so badly infested that it can no longer be used for pea-growing. Once a field has become "pea sick" it must be used for other, and usually less profitable, crops, for some years. There are indications that a period of five to twelve years may be necessary to allow a field to recover.

Since the disease is causing considerable loss and threatens to spread, an investigation of it was undertaken by the Department of Botany, in co-operation with Mr. A. P. MacVannel, District Representative of Prince Edward County, and the Dominion Canners Seeds Limited.

Symptoms of Root Rot and Blight

In fields infested with root-rot the disease generally becomes noticeable just about the time that the peas are coming into blossom, although in severe cases it may be noticed earlier than this. As a rule the seed germinates well in infested soil and a good stand is secured. The plants appear to grow normally for a short time and give promise of a good crop. Then the lower leaves turn white or grey and in a few days or a week the plants wilt down. An examination of a diseased plant indicates root trouble. The roots are usually brown and rotten, the outer layers, or cortex, slough off readily and the little feeding roots are all destroyed. Just at the surface of the ground there is generally a blackened area.

Causal Organisms

Since the investigation began many isolation studies have been made in order to determine the causal organisms. So far the studies show that there are several organisms associated with the disease. Occasionally Rhizoctonia is present. In all cases so far a Fusarium can be isolated from the brown roots and a Pythium from the blackened area near the soil surface. The Fusarium has the characters of *F. vasinfectum var. pisi* Hall and the Pythium agrees with *P. debaryanum* Hesse. Inoculation with the Rhizoctonia will not result in typical root rot. If however, the Fusarium is used as the innoculum, the plants will, in a couple of weeks, show the typical browning of the root system. If the Pythium is used the blackening at the soil line results and the plants if kept wet damp-off. When both Fusarium and Pythium are used typical "blight" results. These results agree, in the main, with those obtained else-

where. However, some workers have obtained additional organisms closely related to Pythium.

Control of the Disease

The causal organisms are soil fungi, that is, are fungi capable of living in the soil for considerable periods, and the point of attack is the roots of the host plants. Since these fungi remain in the soil, seed treatment is of little value. Since the point of attack is the root, spraying is not effective. From the nature of the crop it is impossible to sterilize the soil. This leaves two methods of combating the trouble: (1) crop rotation; (2) the development or discovery of disease resistant varieties.

Crop Rotation

It will take a number of years to determine the length of time necessary to eliminate the disease from a field. We know that more than two years are necessary. We have evidence tending to show that after a period of twelve years an infested field may again be used to grow peas. In some regions in the United States where the disease occurs a rotation scheme of peas once in three, or still better, once in five years is advocated. But, cases are known where a twelve year period was not effective and occasionally the disease develops in a field not previously planted to peas.

Experiments with Resistant Varieties

When looking over a field in which the root rot and blight has been very bad, occasional plants will be seen that have not gone down with the disease. This may sometimes be mere chance but it more often indicates a difference in susceptibility to the disease. These plants can often be used as a starting point for the development of resistant strains or varieties provided they are of a desirable type otherwise. At any rate they show possibilities. The development of a resistant strain from such stray plants is a long process and results can generally be obtained more quickly if seed can be obtained from other sources.

During the summer of 1923 a series of experiments were carried out using various strains of peas which promised to show some resistance. Most of the strains were of the Alaska type since this is the kind of pea bringing the best price at the cannery. Some of the strains were obtained from Wisconsin Agricultural Experiment Station, some were obtained through the United States Department of Agriculture from the pea breeding station in Michigan, and some from the stray plants in the fields in Prince Edward County.

The trial plot was located in a field so heavily infested with root rot that the crop was a total failure in 1922. Seeds of thirty-four selections were sown. The amount of seed available was very limited so that in most cases only about 12 ounces of each kind could be used. The seed was all sown in rows and all strains were given equal care and cultivation.

The different strains exhibited a very striking difference in susceptibility to the disease. A good stand was obtained in all cases but before blossoming time came many of the rows showed pronounced symptoms of blight. None of the strains was immune as

FIGURE 1—The difference in growth between plants susceptible to root rot and plants resistant to the disease. Plants on the left susceptible. Plants on the right resistant.

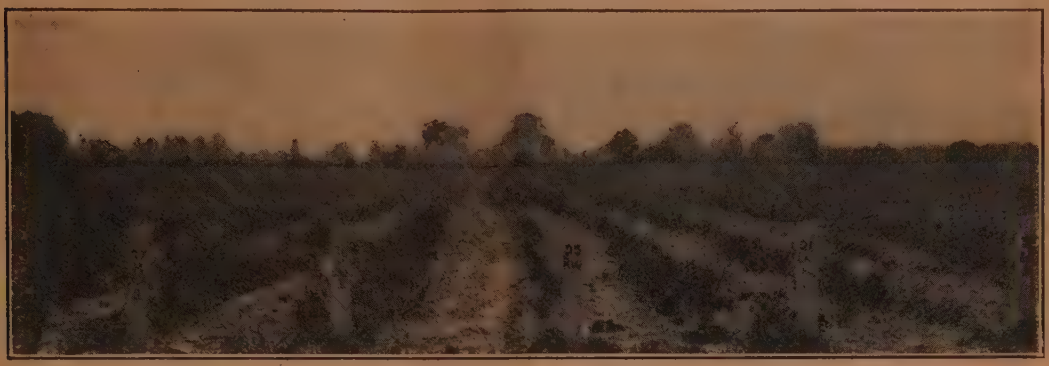

FIGURE 2—A view of a part of the Experimental plot. Row 25, a strain susceptible to the root rot. Rows 26 and 27 quite resistant. Rows 20 and 21 only partially resistant.

even the resistant strains showed small lesions on the roots. However, several strains gave good yields although rows within two feet of them never produced a pod.

This difference in growth may be shown by reference to descriptions taken in the field about the first of July.

Row 2, plants all badly diseased, vines brown and dry, length of straw 4-6 inches, no flowers and no pods.

Row 18, plants green and vigorous, few lesions on the roots, straw 22-25 inches long, 5-6 pods per stem.

Row 26, plants green and vigorous, few lesions, straw 26-28 inches in length, 5-8 pods per stem, still blooming.

The difference in growth is clearly shown by figure 1. Here the plants on the left were very severely attacked and failed to grow to the flowering stage, while those on the right are fruiting quite heavily and still blossoming.

Figure 2 is a view of a part of the trial plot, the difference in growth is again clearly shown. These rows were all planted the same day and given equal attention. Row 25 is a failure, the few plants seen growing in the row are not pea plants but some weeds that had grown since the peas died. Row 26 is one of the high yielding rows but by no means the best. The same is true of rows 27 and 28. Rows 21 and 20 produced only fair yields.

Perhaps the best measure to use in judging the strains is the yield obtained from rows of equal length.

Rows 1, 2, 3, 4, 6, 9, 12, 13, 14, 19, 23, 25, 32 and 33 produced no seed at all, the plants scarcely reached the flowering stage.

Row 10, 2.5 lbs. Row 5, 3 lbs. Row 24, 3½ lbs. Rows 17 and 18, 4 lbs. Rows 8, 15 and 31, 7 lbs. Rows 7, 11, 16 gave a yield of 8 pounds each.

These results are at least encouraging as indicating the possibility of obtaining strains of peas that are resistant to the root-rot and blight even in soil very heavily infested with the causal organisms. Furthermore, these resistant strains are of the type in demand by the canning industry.

It will be considerable time before much of this seed will be available. It never will be a wise policy to depend upon resistant strains entirely. However by the use of such strains, together with a proper system of rotation the disease can be held in check.

GRADUATE SCHOLARSHIP FOR RESEARCH IN THE NUTRITION OF APPLE TREES.

The Chilean Nitrate Committee of Toronto has offered, through the C.S.T.A., a Scholarship of $600.00 for research in the nutrition of apple trees, tenable at a Canadian University. Any member of the C.S.T.A. may make application to the Secretary of the Society. A Credentials Committee will meet during the annual convention at Guelph to consider applications for this, and other scholarships.

Mr. B. Leslie Emslie, a member of the C.S.T.A. is Director of the Chilean Nitrate Committee for Canada, and it was on account of Mr. Emslie's interest in the C.S.T.A. Scholarship Fund that this new scholarship has been made available.

Report of the Committee of Standardization of Descriptive Terms used in Field Experimental Work.

SUBMITTED AND ADOPTED AT THE ANNUAL MEETING OF THE WESTERN CANADIAN SOCIETY OF AGRONOMY, EDMONTON, ALTA., DEC. 28, 1923.

Your committee begs to submit herewith a revised list of descriptive terms used in field experimental work based on a paper read before the Western Canadian Society of Agronomy, December, 1922, by Dr. G. P. McRostie.

A careful consideration of the subject has only served to increase our appreciation of the contribution which Dr. McRostie has made to the standardization of agronomic terminology and of its value for the Western Canadian Society of Agronomy. The changes that we have made are comparatively few and mostly of minor importance. The list of terms stands very much as it was originally presented. It seems highly desirable that the proposed terminology should be widely accepted and adopted by Western experiment stations.

We wish to acknowledge our thanks to Professors Cutler, Champlin and Harrison for valuable assistance. Their suggestions and criticisms were much appreciated.

Signed,

L. E. KIRK, Chairman.

General Descriptive Terms

For Use in Field Experimental Work.

A. GERMINATION

1a. Percent germination — according to standard germination test.

1b. Date of emergence—the date that approximately 50% of the seedlings show above the ground.

1c. Percent stand—the number of plants per unit area compared with the average of the check plots or of all the plots, if no checks are used.

2a. It is suggested that the percent stand be taken after the expiration of 21 days from the date of emergence.

2b. For broadcast plots estimate stand per unit area.

2c. It is also suggested that the stand be taken just prior to harvesting.

B. ROOTS

1a. Root system—the entire root growth of any plant.

2a. Color — according to color chart (Ridgeway).

2b. Form.

3a. Tap roots—when the primary root continues to grow, keeping distinctly larger than the lateral ones.

3b. Tuberous roots — swollen fleshy roots in which food material is stored for future use.

3c. Fibrous roots—as in grasses.

3d. Adventious roots — those which arise from lower and generally subterranean parts of the stem. Hence all grass roots, are in reality adventitious roots.

3e. Brace roots—when adv. roots develop above ground and furnish support, they are termed brace roots or prop roots.

C. STEMS

1a. Tillering—actual count av. no. of tillers per plant.

2a. Stooling—It is suggested that the term stooling be discontinued in describing plants.

1b. Percent lodging,—actual count per unit area.

2a. Differentiate between lodging due to giving way at the nodes and the actual breaking of the straw.

1c. Percent broken stems—actual count per unit area.

1d. Erect—when the majority of the main lower branches are growing parallel with the main axis, 1 to 2 on chart.

1e. Ascending—when majority of the main lower branches are growing at approximately an angle of 45° with main axis, 3 to 4 on chart.

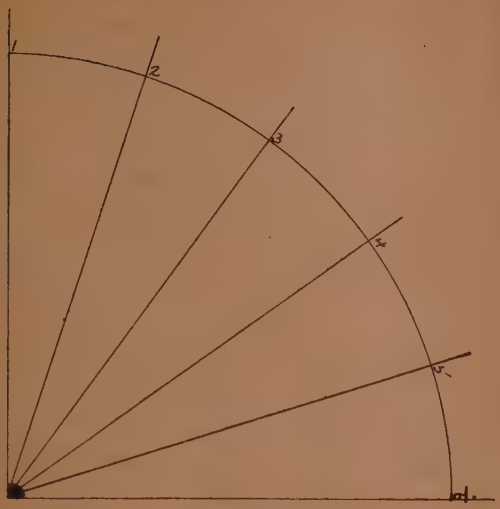

CHART No. 1.

Used by the Plant Breeding Station, Svalöf, Sweden for indicating growth position.

1f. Decumbent—reclining but with the summit ascending.

1g. Spreading—when majority of the main lower branches are growing between an angle of 45 and 90 degrees with the main axis, 4 to 6 on chart.

1h. Trailing or creeping—when the majority of the main lower stems are growing along the ground. 6 on chart.

1i. Inclination—Expressed in numbers according to chart No. 1.

1j. Underground stems—any prostrate or subterranean stem usually rooting at the nodes and becoming erect at the apex.

1k. Twining—a stem that grows spirally, usually requiring support.

1l. Leafiness—actual count of number of leaves on stems or proportionate dry weight in percent.

1m. General color — according to color chart (Ridgeway).

1n. Height—average actual measurement of height from ground to the apex of the inflorescence, not including awns, at time of harvesting or shortly before.

D. HEADS

1a. Percent heads—actual count of flowering and non-flowering culms per unit area at the time of harvesting.

1b. Panicles.

2a. Branches.

3a. Unilateral (side) branches on one side.

3b. Equilateral (spreading) branches distributed around main axis.

3c. Attitude—erect to spreading and intermediate grades as on chart No. 1 based on angle of main lower branches with central axis.

3d. Number of whorls—actual count.

3e. Number of branches—actual count.

2b. Length of panicle—actual measurement, 1st branch to apex not including awn.

1c. Spike or head.

2a. Length — actual measurement base of 1st spikelet to apex not including awn.

2b. Shape.

3a. Tapering towards base.

3b. Tapering towards tip.

3c. Tapering both ways.

3d. Flattened with spikelet.

3e. Square.

3f. Irregular.

2c. Density — based on the actual measurement in millimeters of 10 internodes of the rachis in the center of the spike, and a grouping on this basis into three classes, viz. lax, middense and dense.

2d. Spikelet—the angle formed by the midribs of the two sterile glumes to be taken as the basis of classification.

3a. Spreading widely 4 to 6 on Chart No. 1.

3b. Spreading 2 to 4 on Chart No. 1.

3c. Narrow 1 to 2 on Chart No. 1.

3d. Number of grains in a spikelet —actual count.

3e. Number of sterile flowers — actual count.

3f. Number of bosom oats per spikelet—average actual count.

3g Color of spikelets according to color chart (Ridgeway).

2e. Kernel.

3a. Sterile glume, awned, awn-pointed, awnless, keeled and rounded.

3b. Color of hull (oats)—according to color chart (Ridgeway).

3c. Percent hull (oats) — actual percent.

4a. Thick — approximately three percent more than Banner or equivalent.

4b. Medium — approximately Banner or equivalent.

4c. Thin — approximately 3% thinner than Banner or equivalent.

3d. Color of grain—according to color chart (Ridgeway).

3e. Hardness of kernel (wheat)—determination to be made, at stated standard moisture content.

3f. Length, width and depth of kernels—actual measurements.

3g. Tip (oats) pointed, blunt.

3h. Base (oats).

4a. Pointed, blunt.

4b. Articulate base — non-articulate base.

4c. Hairs—hairless.

1d. Awns.

2a. Awned.

3a. Awn at tip of terminal spikelets of wheat varieties—(apical awned).

4a. Long awned — over three times length of supporting lemma.

4b. Medium awned—2-3 times length of supporting lemma.

4c. Short awned — 1-2 times length of supporting lemma.

4d. Spur—less than ½ length of supporting lemma.

3b. Regular awns of wheat and barley—based on actual measurements of the awns.

Wheat

4a. long–4″ or more

4b. medium–2-4″

4c. short–less than 2″

Barley

4a. long–5″ or more.

4b. medium–3-5″

4c. short–less than 3″

3c. All other grasses — classification or awn based on the relationship of awn to supporting lemma.

4a. Long awned—when awn is longer than the supporting lemma.

4b. Medium awned—when awn is between ½ and 1 times length of supporting lemma.

4c. Short awned—when awn is shorter than ½ times length of supporting lemma.

3d. Color — according to color chart (Ridgeway).

3e. Shape.

4a. Straight or twisted.

4b. Barbed or smooth.

2b. Awnless.

Miscellaneous Descriptive Terms

A. BLOOM

1a. Early bloom—from time that the first flowers have bloomed until it is in full bloom.

1b. Full bloom—from time that 25% of all heads are in full bloom (i.e.) when flowers are in bloom throughout two-thirds or more of its entire length and 25% or more additional heads have begun to bloom until 25% of all heads are past full bloom and 25% or more additional heads are past bloom through some portion of their length.

1c. Late bloom—a grass is in late bloom from the time that it has passed full bloom until it is in very late bloom.

1d. Very late bloom—a plant is in very late bloom when all of the main crop of heads are entirely past bloom, and only a few small late heads usually on short culms remain in bloom.

B. MATURITY

1a. A grass plant may be said to be mature when all of the glumes have become straw colored on 25% of the heads and more than half of the glumes have become straw coloured on 50% or more additional heads.

C. GREEN WEIGHT

1a. Actual weight at time of harvesting—the whole of small plots up to 1/20 acres or representative areas of stated size and number systematically distributed, for larger plots if the whole is not harvested.

D. DRY WEIGHT

1a. The absolute dry weight.

2a. In the case of forage plants it is suggested that before being published these absolute weights be translated into terms of the optimum moisture content for well cured hay in any district.

1b. Suggest publishing both absolute weight (over dry weight) and cured hay.

E. DISEASES

1a. Rust—use of Washington (U.S.D.A. Bur. Pl. Ind.) chart showing frequency of pustules. Notes should be taken also on size of pu[illegible] of plants showing rust.

1b. Percent Smut—actual count of the number of smutted heads vs. healthy heads in 500 heads counted at least in three different parts of the field or plot.

1c. Other diseases — actual percent of plants showing the diseases.

F. EARLINESS OF GROWTH

1a. Actual date that first growth appears on at least 50% of the plants under test.

G. AFTERMATH

1a. Actual average measurement of length of growth with leaves stretched up at definitely stated intervals after harvesting.

H. SEED

1a. Hulless—seed from which the hull has separated.

1b. Hulled—seed with hull attached.

I. CLOVERS AND ALFALFA

1a. Mostly covered by general descriptive terms.

1b. Leafiness — percent of leaf to stem —actual absolute dry weight of leaf and stem separated from average number of representative plants.

1c. Leaf markings.

1d. Blossom color — according to color chart (Ridgeway).

1e. Date ripe—when seed shells out of majority of heads readily when heads are dry.

1f. Hardiness—percent of plants that live through the winter barring mechanical injuries to roots—based on actual count.

2a. Distinguish between physiological and morphological hardiness.

1g. Branching — count of average number of primary, secondary etc., branches per average number of plants.

J. FIELD ROOTS

1a. Germination—as in general terms.

1b. Percent stand—number of roots per unit number of feet compared with a perfect stand (i.e. perfect stand is one root every 6-8-10-12 inches depending on the average distance to which they are thinned.)

1c. Tops.

2a. Weight—green weight at time of harvesting.

2b. Amount—actual count of average number of leaves per plant during growth season.

1d. Roots.

2a. Green weight—actual weight of topped roots immediately after harvesting.

2b. Dry matter — actual dry weight (oven dried).

2c. Type.

3a. Shape—according to Scandinavian standard or Canadian standard when completed.

3b. Color — according to color chart, (Ridgeway).

2d. Uniformity.
3a. Size—actual percent variation from the standard.
3b. Shape—actual percent variation from the standard.
3c. Color—actual percentages of various colors according to color chart (Ridgeway).

K. CORN

1a. Ear
2a. Cylindrical.
3a. Tapering towards butt.
3b. Tapering towards tip.
3c. Tapering both ways.
2b. Length—actual average length.
3a. Long—over 8 inches.
3b. Medium—6 to 8 inches.
3c. Short—under 6 inches.
2c. Circumference — actual average measurement 2″ from butt of a number of representative ears.
2d. Space between rows—use Metric system. Space recorded in m.m. as distance between shoulders of kernels.
2e. Arrangement of rows.
3a. Regular or irregular.
3b. Paired or single.
2f. Tips exposed, covered.

1b. Cob.
2a. Size of cob—actual measurement.
3a. Large—larger than 4½″ in circumference.
3b. Medium—3½ to 4½″ in circumference.
3c. Small—less than 3½″ in circumference.
2b. Size of shank—actual measurement
3a. Large—nearly diameter of cob.
3b. Medium—half diameter of cob.
3c. Small—one third diameter of cob.
2c. Color of cob—according to color chart (Ridgeway).

1c. Kernel
2a. Color—determined according to color chart (Ridgeway).
2b. Indentation—rough, smooth, shallow, deep, dimple, creased, beaked, pinched.
2c. Shape—wedge, round, square, parallel sided, pointed.
2d. Length—actual measurement.
2e. Number of rows—actual count 2″ from butt.

1d. Stalk.
measurement of 10-20 or more ears (upper and lower separated).
2b. Number of tillers—actual count.
2c. Amount of leaves — see general terms.
2d. Number of single ear stalks—actual count.
2e. Number of double ear stalks—actual count.
2f. Number of triple ear stalks—actual count.
2g. Number of barren stalks — actual count.
2h. Percent nubbins — actual count at time of harvesting.
2i Yield of grain — actual yield of shelled corn, moisture free or with amount of moisture present definitely stated.
2j. Yield of fodder — absolute dry weight—see general terms.

L. SUNFLOWERS

1a. Type of growth.
2a. Single stem.
2b. Branching.
3a. Uni-branching—Primary branches only.
3b. Multi-branching — where there are secondary as well as primary branches.
3c. Type of branching—high, low.
2c. Angle of branching—according to chart No. 1.
2d. Leafiness — number of primary leaves per unit length or relative proportion of leaf and stem expressed in percent and based on absolute dry weights.
2e. Size of head — actual average measurement of a representative number of heads.
2f. Size of seed—actual average measurement of a representative number of seeds.
2g. Color of seed—according to color chart (Ridgeway).

N.B.—The color chart suggested in connection with this report is the one used by the National Museums of both Canada and the United States, as well as by various other institutions where definite color determinations are required. It is compiled and published by Dr. Herbert Ridgeway, U.S. National Museum, Washington, D.C. and costs

A New Method for Determining Butter Fat in Milk and Cream.

E. G. HOOD

Chief, Division of Dairy Research, Dairy and Cold Storage Branch, Ottawa.

A new method for determining butter-fat in milk and cream, designed and perfected by Dr. Hoyberg of Copenhagen, Denmark, and known as "The Hoyberg Method" has recently been introduced into Canada.

Plan of Work.

Opportunity presented itself to investigate the merits and accuracy of the new method in the hands of different workers; as a result, a number of comparative tests have recently been made by the Division of Chemistry, the Division of Dairying, Experimental Farm, Ottawa, the Ottawa City Dairy Laboratory and the Division of Dairy Research.

This paper comprises the results of two separate investigations, designated as Experimental Part I and II.

Experimental Part I on page 248 is submitted as received and involves the findings of the Division of Chemistry, Division of Dairying and the Ottawa City Dairy Laboratory.

Experimental Part II on page 249 involves the findings of the Ottawa City Dairy Laboratory and the Division of Dairy Research.

Description of Methods Employed.

The Hoyberg method was compared with the Röse-Gottlieb method (using the latter as a standard) and with the Babcock method. Brief descriptions of the methods are given.

I. The Hoyberg Method for Milk.

1. *Apparatus and Chemicals.*

The tester is composed of a neat metal box 8″x12″x6″ and equipped with the following:

1—9.7 m.l. pipette for milk sample.
1—3.4 m.l. pipette for reagent I.
1—1 m.l. pipette for reagent II.
6—milk butyrometers, graduated in one-tenths to 7 per cent, with double rubber stoppers.
1—100° centigrade thermometer.
1—water bath to accommodate the 6 butyrometers and alcohol burner.
1—bottle alcohol for burner.
1—bottle reagent I (chemically unknown).
1—bottle reagent II (chemically unknown).

2. *Manipulation of the Test.*

Immediately before testing, the samples were brought to a temperature of 70° F., and thoroughly mixed. 9.7 m.l. of the sample, 3.4 m.l. of reagent I and 1 m.l. of reagent II were added to the butyrometer. The rubber stopper was then placed and the whole vigorously shaken for about one minute. The remaining five samples were similarly treated. After this, they were placed in the water bath at 150°F., with the stoppers upward. After about 7 minutes, the butyrometers were removed, shaken for about a quarter of a minute, replaced in the water bath, first for about 7 minutes with the stoppers upward, then for about 7 minutes with the stoppers downward, after which the fat percentages were read without the use of dividers, reading from the bottom of the upper meniscus. With the outfit at hand, it was only permissible to make six determinations at one time.

II. The Hoyberg Method for Cream

1. *Apparatus and Chemicals.*

The cream tester differs from that of the milk as follows:

6—Cream butyrometers graduated in 1 to 50 per cent.
1—4.65 m.l. pipette for cream.
1—5.5 m.l. pipette for reagent I.
1—bottle reagent I (chemically unknown).
1—bottle reagent II (chemically unknown).

2. *Manipulation of the Test.*

Immediately before testing, the samples were brought to a temperature of 70°F., and

thoroughly mixed. 4.65 m.l. of cream, 5.5 m.l. of reagent I and 1 m.l. of reagent II were added to the cream butyrometer. The rubber stopper was then placed and the whole vigorously shaken for about one minute. The remaining five samples were similarly treated. They were then placed in the water bath at 150°F., with the stoppers upward for about 7 minutes, removed, shaken for about one-quarter of a minute and replaced with the stoppers downward for 7 minutes, after which the fat percentages were read without the use of dividers, reading from the bottom of the upper meniscus. As in milk, only six determinations could be carried out at one time.

III. The Babcock Method for Milk and Cream.

1. *Apparatus and Chemicals.*

The Babcock testing equipment approved by the (1) American Dairy Science Association was used.

2. *Manipulation of the Test.*

According to above directions.

IV. The Rose-Gottlieb Method for Milk and Cream.

1. *Apparatus and Chemicals.*

As outlined by Mojonnier and Troy (2).

2. *Manipulation of the Test.*

As above, with the exception that in the case of cream, three extractions instead of two were made.

EXPERIMENTAL PART I.

I. Milk.

Twenty-two samples of milk were analysed as to fat content by the Röse-Gottlieb, Hoyberg and Babcock methods. The results are tabulated as follows:

(1) Huziker O.F.—Specifications and directions for testing milk and cream for butter-fat. Jour. Dairy Sci. V, No. 2, p. 178.

(2) Mojonnier and Troy—The Technical Control of Dairy Producers, First edition, 1922.

Table I.

Fat Content of Milks as determined by Röse-Gottlieb, Hoyberg and Babcock Methods.

No. of Sample	*Röse-Gottlieb	*Hoyberg	Babcock	Source of Babcock Test
	per cent	per cent	per cent	
1	4.39	4.55	4.40	*M
2	2.91	2.95	3.00	M
3	4.19	4.35	4.10	M
4	3.88	4.00	3.90	M
5	4.08	4.22	4.10	M
6	3.60	4.00	3.77	M
7	4.04	4.28	4.10	M
8	3.70	4.00	3.60	M
9	3.86	3.96	3.80	M
10	4.04	4.10	4.50	M
11	3.89	3.89	4.10	M
12	3.82	3.90	3.80	M
13	3.94	4.00	3.90	M
14	4.08	4.15	4.00	M
15	2.87	2.88	—	
16	3.40	3.52	—	
17	2.08	2.09	—	
18	5.30	5.65	5.60	*O.D.
19	3.27	3.40	3.45	O.D.
20	2.28	2.40	2.48	O.D.
21	3.31	3.60	3.62	O.D.
22	3.67	3.82	3.92	O.D.
23	3.53	3.70	3.69	O.D.
24	6.37	—	6.42	O.D.
25	4.54	4.80	4.63	O.D.
26	5.72	6.00	5.83	O.D.
27	3.34	—	3.56	O.D.
†Average	3.91	4.08	4.01	

†The averages have been taken from results of samples analysed by all three methods.

*Determinations made by the Division of Chemistry, Experimental Farm, Ottawa.

*M. Determinations made by the Division of Dairying, Experimental Farm, Ottawa.

*O.D. Determinations made by the Ottawa City Dairy Laboratory.

The results show that the Hoyberg method gave an average figure of 0.17 per cent higher than the Röse-Gottlieb and 0.07 per cent higher than the Babcock. This latter—the Babcock method—as operated, gave on the average results 0.10 per cent higher than the Röse-Gottlieb which is accepted as a standard method.

II Cream

Fourteen samples of cream were examined, nine of which were analysed by all methods, the remaining five by the Hoyberg and Röse-Gottlieb methods only.

The fat content of the creams examined as determined by the three methods is given in the following table:

Table II.

Fat Content of Creams as determined by Röse-Gottlieb, Hoyberg and Babcock Methods.

No. of Sample	*Röse-Gottlieb per cent	*Hoyberg per cent	Babcock per cent	Quality of Cream	Source of Babcock Test
1	40.77	40.5	40.5	Past	*O.D.
2	28.47	28.6	28.3	"	O.D.
3	20.40	20.8	20.7	"	O.D.
4	29.93	29.5	29.6	Sour	O.D.
5	21.37	21.8		Past	
6	30.66	31.2		"	
7	31.52	31.5		"	
8	24.13	24.6		"	
9	51.98	51.3		"	
10	28.45	28.5	28.5	Sour	O.D.
11	26.69	26.6	26.6	"	O.D.
12	38.50	38.5	39.0	Past	O.D.
13	28.61	28.5	28.4	"	O.D.
14	20.30	20.5	20.6	"	O.D.
†Avge.	29.13	29.11	29.13		

†The averages have been taken from results of samples analysed by all three methods.

*Determinations made by the Division of Chemistry, Experimental Farm, Ottawa.

*O.D. Determinations made by the Ottawa City Dairy Laboratory.

The results on cream from all three methods show remarkable agreement. Since the Hoyberg method has an inherent error in using a measured (by volume) and not a weighed sample, it might be expected that its results would be somewhat lower than those by the Röse-Gottlieb on samples with a very high fat content and somewhat higher than the Röse-Gottlieb on creams of very low fat content. This receives a certain measure of confirmation from the results presented, but for its establishment, it would be necessary to analyse a larger number of creams. The error, in any case, according to present results, would be of small magnitude.

Comments.

The Hoyberg method appears to be peculiarly well adapted to the determination of fat in cream, being not only simple to operate and rapid, but giving results very close to those of the standard method of analysis—the Röse-Gottlieb.

As already stated, the Hoyberg method is simple and rapid; it further eliminates the use of sulphuric acid and the centrifuge. It, however, has the disadvantage from the practical standpoint of employing four distinct solutions for milk and cream, whereas, the Babcock requires only one—sulphuric acid. It is further to be noted that in milk analysis the Hoyberg method difficulty was quite frequently experienced by the forcing out of the rubber stoppers from the butyrometers in which case the determination is lost.

EXPERIMENTAL PART II.

I. Milk

Nine samples of milk are reported as representative determinations of the fat content with the Hoyberg and Babcock methods. The results are as follows:

Table I.

Fat Content of Milks as determined by the Hoyberg and Babcock Methods.

No. of Sample	*Hoyberg per cent	†Babcock per cent	Milk Quality
1	3.75	3.83	12-24 hrs.
2	3.80	3.83	"
3	3.25	3.42	"
4	4.20	4.20	"
5	4.30	4.20	"
6	3.25	3.30	"
7	5.30	5.20	"
8	4.85	4.80	"
9	4.40	4.50	"
Average	4.12	4.14	

In reading the fat column of milk with the Hoyberg method, it was noticed that the difference between the entire upper curve and reading to the bottom of the curve was .2 to .3 per cent.

The above results of the Hoyberg and the Babcock methods on milk show extremely close agreement.

II. Composite Milk Samples.

Some difficulty in reading the fat column was experienced with the Hoyberg method on ten day composite milk samples preserved with bichloride of mercury tablets. The accumulation of a dark precipitate on the bottom of the fat column made readings at times difficult and inaccurate. In other cases, this precipitate was distributed throughout the fat, so that a satisfactory reading was obtained.

III. Unpasteurized Sweet Cream.

Nine representative samples of cream are reported as to fat content with the Hoyberg and Babcock methods. The results are as follows:

Table II.

Fat Content of Creams as determined by the Hoyberg and Babcock Methods.

No. of Sample	*Hoyberg	†Babcock	Condition of Cream
	per cent	per cent	
1	32.5	32.5	Sweet, Unpasteurized
2	25.5	25.5	" "
3	44.5	46.0	" "
4	38.0	38.0	" "
5	35.0	35.5	" "
6	32.0	32.5	" "
7	35.0	35.0	" "
8	43.0	43.0	" "
9	34.0	34.0	" "
Average	35.5	35.8	

In reading the fat column of cream with the Hoyberg method, a difference of 1 per cent was noted between the top and bottom of the meniscus.

The above results of the Hoyberg and the Babcock methods show extremely close agreement.

IV. Sour Cream.

Twelve samples of sour cream are reported as to fat content with the Hoyberg and the Babcock methods. This cream was selected from cream cans as daily received at the Ottawa Dairy. The samples were as nearly as possible free from gas. Before taking the samples for the analysis, they were thoroughly warmed to 90°F., and homogenously mixed. The results were as follows:

Table III.

Fat Content of Sour Creams as determined by the Hoyberg and Babcock Methods.

No. of Sample	*Hoyberg	†Babcock	Condition of Cream
	per cent	per cent	
1	41.0	41.5	Unpast. .5 to .8% acid
2	24.5	25.2	" "
3	19.5	20.3	" "
4	21.5	23.0	" "
5	31.0	31.5	" "
6	28.0	32.0	" "
7	47.5	51.5	" "
8	20.0	20.5	" "
9	29.5	29.5	" "
10	27.5	27.5	" "
11	26.5	27.8	" "
12	26.5	28.0	" "

From the above table it will be observed that of the twelve samples reported, five gave a greater variation than 1 per cent and up to 4 per cent. This Hoyberg variation is undoubtedly due to the pipetting of incorporated air or gasses contained in the samples, thus resulting in a lower reading than the Babcock test.

V. Foamy or Gassy Cream.

Three samples of foamy or gassy cream are reported as to fat content with the Hoyberg and Babcock methods. The results are as follows:

Table IV.

Fat Content of Foamy or Gassy Creams as determined by the Hoyberg and the Babcock Methods.

No. of Sample	*Hoyberg	†Babcock	Condition of Cream
	per cent	per cent	
1	25.5	31.0	.8% acid, gassy
2	24.5	30.0	" "
3	23.0	31.5	" "

From the above table, it is quite apparent that the Hoyberg results differ very widely from the Babcock; ranging in differeneces from 5.5 to 8.5 per cent. For creams of this condition, the Hoyberg method was not found applicable.

VI. Agitated Sweet Cream.

One sample of sweet cream agitated with an egg beater is reported as to fat content with the Hoyberg and the Babcock methods. The result is as follows:

Table V.

No. of Sample	*Hoyberg	†Babcock	Condition of Cream
	per cent	per cent	
1	20.0	40.75	Sweet - agitated

*Determinations made by the Division of Dairy Research apply to Tables I to V.

†Determinations made by the Ottawa City Dairy Laboratory apply to Tables I to V.

The above table shows that with sweet cream agitated, the Hoyberg reading was only half that of the Babcock. The error was apparent in measuring out the cream for weighing with the Babcock test, as it required almost 18 m.l. for a 9 gram sample. Application is found in this where partially filled cans are loaded and received at the factory in a very agitated condition.

Comments.

A. Accuracy of Hoyberg Method.

1. The Hoyberg method was found to check very accurately with the official Babcock test on samples of commercial milk.

2. The Hoyberg and Babcock methods compared on cream samples were as follows:

(a) Sweet cream—Hoyberg within 1 per cent.

(b) High acid cream—Hoyberg 0 to 4 per cent lower readings.

(c) Gassy or yeasty cream — Hoyberg 5.0 to 8.5 per cent lower readings.

(d) Agitated sweet cream — Hoyberg 20.0 per cent lower reading.

3. Composite milk and cream samples checked very closely, but frequently difficulty was experienced in reading the test due to the accumulation of a dark precipitate in the fat column.

B. Manipulation of Hoyberg Method.

1. No specific directions accompany the apparatus.

2. A temperature of 150°F., cannot be easily if ever reached with the equipment provided.

3. The outfit is provided with a centigrade thermometer. Temperature directions are given in Fahrenheit.

4. The Hoyberg test as carried out with a six butyrometer tester requires considerable more time than the Babcock test; with cream, very little difference was experienced.

5. The annoyance and loss of tests from the forcing out of stoppers greatly detracted from its efficiency. Failure to get the fat column into the graduated neck of the bottle caused the loss of many readings as well as inaccuracies.

6. Three pipettings as compared to one in the Babcock add difficulty to the layman and often to the accuracy of the test.

7. From a practical standpoint, the Hoyberg method is confusing in that it employs four distinct solutions for milk and cream.

8. The operator has no means of checking the strength and purity of the reagents used with the Hoyberg method.

9. From the standpoint of the operator, the Hoyberg method is safer than the Babcock tester.

10. The Hoyberg method requires no centrifuging or the use of corrosive chemicals as sulphuric acid.

11. The test can be carried out under more primitive conditions than the Babcock test. It is not foolproof, however, and will give in the hands of the inexperienced work as unsatisfactory results as the Babcock test.

C. General.

1. Government tested glassware does not accompany the apparatus.

2. No information is available on the initial cost and upkeep of the Hoyberg method as compared with the Babcock test.

3. Government laws require that cream be weighed for testing rather than measured. The former method is obvious.

4. No determinations are reported on whey, skim-milk and buttermilk, as glassware was not available.

5. The Hoyberg method might find a limited use among farmers for testing milk and sweet cream on the farm. It is false economy, however, to instal a newer method which is unofficial and which cannot be used as widely as the official Babcock test.

Concerning the C.S.T.A.

COMMITTEE ON GRADUATE STUDY.

G. G. Moe, Associate Professor of Agronomy at the University of British Columbia, has accepted the invitation of the Society's Executive Council to act as chairman of the Committee on Graduate Study for the remainder of the year. The appointment was made necessary by the resignation of Dr. Robert Newton, as announced in the December, 1923, issue of *Scientific Agriculture*.

APPLICATIONS FOR MEMBERSHIP

Davidson, J. G. (Toronto, 1922, B.S.A.) Charlottetown, P.E.I.

Houde, M. A. (Montreal, B.S.A.) Laprairie, P.Q.

Hilton, S. A. (Toronto, 1923, B.S.A.), Nappan, N.S.

Jamieson, H. W. (Toronto, 1922, B.S.A.) Niagara Falls, Ont.

Lambert, P. (Montreal, 1920, B.S.A.) Notre Dame du Lac, P.Q.

Rollin, J. T. (Montreal, 1922, B.S.A.) Papineauville, P.Q.

ADDRESSES WANTED

The General Secretary would like to know the present addresses of the following members:

J. A. Steele (O.A.C. 1920) formerly at Chinook, Alta.

J. E. Meagher (Alta. 1921) formerly at Marsden, Sask.

R. M. Scott (Queens, 1917) formerly at Olds, Alta.

H. D. Mitchell (Macdonald 1915) formerly at Toronto, Ont.

WHO'S WHO

There has been some delay in completing the C.S.T.A. Who's Who, but at the time of writing most of the biographies are in type form ready for printing. A local committee will make a careful revision of all biographies early in April, in order to ensure as much uniformity as possible. About 94 per cent. of the members will be included in the volume. Printing should be completed in April.

THE AGRICULTURAL GAZETTE

On instructions from the Dominion Minister of Agriculture, the *Agricultural Gazette* ceased publication with the March-April issue. For eleven years it has been published regularly by the Dominion Department of Agriculture, and in official as well as all professional circles, it will be greatly missed. The final orders for discontinuance were so unexpected that a brief and hurriedly prepared enclosure in the last issue was the only message the Editor was able to send to his readers.

With the discontinuance of the Federal Grant for Agricultural Education, it was perhaps reasonable to expect the *Gazette* to cease publication. It came into being in 1913 to serve as a medium through which to publish much of the work accomplished by means of the Federal Grant. Since that time, however, it has developed into an extremely valuable and interesting magazine, covering a wide range of subjects, furnishing to professional men a record of federal and provincial activities, and including a very complete list of abstracts of recent agricultural literature. In its field it had practically no competitors, and it will be unfortunate if the Federal and Provincial Departments of Agriculture now find it necessary to confine the publication of their activities, and the results of their work, to bulletins, circulars, etc. These do not have the same popular appeal and usually do not appear as promptly as the regular issues of a magazine.

Suggestions are perhaps premature as yet, but it is to be hoped that some substitute for the *Agricultural Gazette* is being contemplated.

NOTES.

J. B. Harrington (Saskatchewan, '20), who is studying for his Ph.D. at the University of Minnesota as Shevlin Fellow in Agriculture, has been appointed Assistant Professor of

Field Husbandry at the University of Saskatchewan. He will assume his new duties on July 1st, 1924.

W. D. Jackson (O.A.C. '09), Assistant Director of the Agricultural Representatives Branch, Ontario Dept. of Agriculture, has been appointed Secretary and Manager of the Guelph Winter Fair. The position vacated by this appointment has been filled by J. A. Carroll (O.A.C. '14) who has been Agricultural Representative in Peel County, Ontario, since 1914.

A. R. Jones (Macdonald '21), formerly District Poultry Promoter for Prince Edward Island, under the Dominion Live Stock Branch, was appointed Assistant Manager of the P.E.I. Co-operative Egg and Poultry Association last January.

Frank Laughland (Manitoba '21) who has been taking graduate work at Macdonald College, under the Wm. C. Macdonald Regd. Scholarship (Manitoba) has been obliged to discontinue his studies on account of ill health He has returned to his former duties with the Soldier Settlement Board at Winnipeg, as Field Supervisor.

R. C. Elder (O.A.C. '18) is now teaching Agriculture and Science at the Stamford High School, Niagara Falls, Ont.

F. C. Nunnick (O.A.C. '10) Director of Publicity at the Central Experimental Farm, Ottawa, and E. Rhoades (Macdonald '12) Asst. Chief of the Poultry Division, Dom. Live Stock Branch, have left for England in charge of Exhibits to be shown at the British Empire Exposition.

F. C. Elford, Dominion Poultry Husbandman and E. Rhoades (see above) will represent the Dominion Dept. of Agriculture at the Convention of the International Association of Instructors and Investigators in Poultry Husbandry, to be held at Barcelona, Spain, in May, 1924.

A. E. Raymond (Macdonald '13) has resigned his position with the Soldier Settlement Board and is now farming at Woodstock, N.B.

T. O. Clark (O.A.C. '12) is now farming at Edmonton, Alta., and acting as temporary seed, feed and fertilizer inspector under the Dominion Seed Branch.

E.A. Weir (O.A.C.'12) has been appointed Superintendent of Intelligence and Publicity for the Canadian National Railways at London, England. He was formerly Manager, and Chairman of Board of Directors, of the Province of Manitoba Savings Bank.

Dr. G. C. Creelman, formerly President of the Ontario Agricultural College, with Mrs. Creelman, left Toronto on March 29th, to visit their married daughter (Mrs. N. Curtis) at Edmonton. Dr. Creelman is extending his trip to the Pacific Coast and will address C.S.T.A. meetings at Fort William, Winnipeg, Regina, Saskatoon, Edmonton, Calgary, Summerland (B.C.) and Vancouver.

STANDARIZATION OF DESCRIPTIVE TERMS USED IN AGRONOMIC PRACTICES.

An increasing realization is being manifested by agronomic experimentors throughout the country of the desirability, if not actual necessity, of more uniformity in experimental methods.

A phase of this work which should not be affected by geographical location, and which therefore should be a fruitful field for rapid progress is the standardization of descriptive terms used in agronomic work.

The Western Canadian Society of Agronomy has made a good start in this direction by adopting the report of its committee on standardization of descriptive terms used in Field Experimental Work. No claim for completeness is made but an attempt has been made to standardize many of the more common terms used in recording data on field crops. The chief aim of the committee in submitting the terms included in the report was to substitute, wherever possible, definite measurements or clearly defined terms for indefinite words or phrases. The report is published on page 242 of this issue.

The general adoption by the agronomists of this country of as many of the submitted terms as possible, and an early agreement on any terms in dispute or yet needed to make the list reasonably complete would greatly facilitate a better understanding of agronomic publications in Canada.

Parlons Coopération de Vente.

Par LOUIS BÉRUBÉ.

Inspecteur des Coopératives de Pêcheries de Québec.

"L'Esprit d'Association devient un des plus pressant besoin sinon une nécessité de l'heure présente",

(Leroy-Beaulieu).

Trop de classes dans l'agencement actuel d'une communauté quelconque sont aujourd'hui unies pour que nous discutions ici la supériorité de la considération des forces sur l'effort individuel.

L'individualisme a fait son temps. S'il a pu créer et créer encore nous l'espérons, des célébrités dans des cas particuliers que nous ne considérerons pas plus longuement, appliqué au sein des masses populaires, il a toujours été et sera toujours le meilleur frein qui enrayera leur marche vers le progrès.

DES FAITS

Aujourd'hui il suffit d'une heure et souvent moins à un professionnel, un commerçant et même un artisan quelconque (1) pour gagner le salaire d'une semaine et souvent plus de la moyenne de nos cultivateurs(2). Sans doute dans cette différence énorme, il faut pour certaines classes faire la part qui revient au travail intellectuel pour d'autres classes celle de certains facteurs incontrôlables contre lesquels il faut pour certaines classes faire la part qui revient au travail intellectuel pour d'autres classes celle de certains facteurs incontrôlables contre lesquels il faut lutter, mais toutes réserves faites, il n'en reste pas moins une bonne marge due à l'entente et aux associations qui tiennent les membres de ces différentes classes unis en bloc solide quand il s'agit de défendre un droit réel ou prétendu.

L'ASSOCIATION.

Il ne s'agit pas pour nous d'un droit à défendre; c'est "justice" qui'il faudrait créer sur toute la ligne. Le cultivateur a besoin d'argent tout comme tout autre humain. Il a des necessités de famille, il a ses échéances à payer sur un matériel de culture dispendieux, et ses produits se vendent pratiquement à des prix dérisoires. Nous répètons cette vérité devenue un lien commun: "Il lui faut de l'union" pour obtenir tout cela.

Association professionnelle ou coopérative de vente? A la rigueur la première pourrait suffire tant bien que mal dans les classes peu nombreuses de la société elle suffit même. La pression qu'elle peut exercer dans le domaine économique ou politique suffit d'habitude à lui faire obtenir ce qu'elle voulait pour ses membres. Nous ne le négligerons pas, nous ne lui contesterons pas son influence mais pour remplir le programme tracé, elle est inadéquate; il faut l'association coopérative pour la compléter.

LA COOPERATIVE.

Que l'on nous comprenne bien encore ici. Nous ne voulons pas non plus insinuer que le système coopératif est incomplet et boiteux par lui-même. Loin de nous cette pensée. Nous voulons simplement lui marquer sa place dans sa succession chronologique et naturelle de l'evolution de l'esprit d'association dans les masses. Et si complète que soit l'association professionnelle, elle ne pourra jamais atteindre pleinement son but si la coopérative n'est pas là. A quoi sert-il de prêcher et de reprêcher l'amélioration des cultures si toute cette science ne se traduit pas pour le cultivateur par quelques écus sonnants en son gousset? Et comment les avoir sans prendre la maîtrise des marchés? Et comment prendre la maîtrise des marchés sans coopérative?

(1) Cet article est écrit des Etats-Unis, où l'auteur étudie actuellement à une Ecole de pêcheries pour venir en aide aux nouvelles coopératives de pêcheurs de la province de Quebec.

(2) Nous nous remémorons à cet effet une caricature du Country Gentleman en date du 9 février 1924 et intitulée: 'Ce que le briquetier recevrait si son salaire d'une seule journée lui était payé en produits du sol. Et on le voit chargé d'une canistre de lait une caisse de poules, plusieurs sacs sur son épaule, un petit cochon de lait et un panier d'oeufs sous son bras tandis que ses deux aides (il lui en faut deux pour tout emporter) charroient des pommes de terre, des fruits et des légumes.

DEFINITIONS ET PRECISIONS.

De ces données il nous est facile maintenant de déduire une définition adéquate d'une coopérative de vente. C'est une association de cultivateurs (puisque nous écrivons pour la classe agricole) formée dans le but de maîtriser le marché de leurs produits en vue d'en retirer la plus forte rénumération possible pour leur travail.

Une société coopérative est donc par essence une association de cultivateurs. Cela veut-il dire qu'il aille sauvagement se limiter à ceux-là seuls qui dirigent une exploitation agricole? Oui, en principe, pas nécessairement en pratique. Surtout lorsqu'il s'agit de l'amitié sure qui pourrait porter à l'association un professionnel dévoué. Nous ne voyons pas pourquoi l'Association serait trop exclusiviste. Elle serait bien folle de négliger de mettre ces atouts de son côté. Quelques fois le pasteur même ne ménage pas son appui en autant que son rôle et ses devoirs de curé le lui permettent pourquoi refuser de se l'adjoindre?

Mais comme en ce bas monde, il faut se fier à chacun et se défier de tout le monde, nous ne saurions trop recommander la prudence aux directeurs dans le choix de leurs membres.

LE CONTRAT.

Quand on fait les frais de bâtir un système coopératif il faut construire solide et viable. Or on ne peut prêcher la solidarité des individus ayant des liens communs de classes; on doit même le faire. C'est tres bien; c'est mettre en jeu un facteur moral dont on serait très gauche de nier l'influence. Il faut bien se garder aussi de créer que la coopération après tout n'est qu'une question de piastres et de sous, de peur que les pseudo-coopérateurs n'en profitent pour renier la coopérative pour trente deniers.

Que faire donc? *In medio sta virtus* veut l'adage latin: sachons nous en contenter. S'il faut ponter d'un coté sur le sens social des coopérateurs il ne faut pas négliger non plus de tenir compte des données pratiques et nécessaires du commerce. Ces deux points également importants, ils sont compris dans le contrat, contrat entre les coopérateurs et leur Association.

Par celui-ci en effet les producteurs s'engagement pour un temps déterminé et sous certaines restrictions à livrer la totalité de leurs produits à cette dernière. Voilà le signe sensible du sens social de ceux qui le signent; voilà d'autre part une arme financière puissante dans les mains d'une association.

L'instabilité des marchés agricoles, la question de bâtir des entrepôts pour pouvoir décongestionner les débouchés: autant de choses rapidement résolues quand une association coopérative est assurée pour un certain nombre d'années d'une production qui ne laissera pas ses entrepôts vides ou son personnel à ne rien faire, quand des directeurs savent que leurs membres ne jetteront pas l'association pardessus bord dès qu'un concurrent leur offrira tapageusement un bénifice passager.

Aussi toutes nos bonnes sociétés coopératives de vente ont le contrat ou sont en train de l'établir (3).

LA COOPERATION CENTRALE.

Il est un principe qui semble sacré dans l'organisation coopérative des fermiers américains. C'est que chaque ligne de produits doit s'organiser par elle-même et distincte des autres.

Ainsi avons-nous dans le même état, la Centrale des producteurs de fruits, la Centrale des producteurs de baies, la Centrale des producteurs d'oeux, etc.

Ces principes nous les trouvons enseigné dans les manuels autant que par la bouche des divers propagandistes du mouvement. Nous n'osons y toucher de ront pas même une attaque de biais, à peine l'influencerons-nous d'une question. La Centrale unique et Centralisante comporte une injustice trop flagrante pour que nous l'adoptions ainsi. Il est trop cavalier par example de faire payer un échec dans une certaine ligne par des bénifices plus orts dans d'autres lignes et nous ne comprendrons jamais que la solidarité sociale doive aller jusqu'à depriver son frère de son juste dû sous pretexte que le nôtre nous a pas assez rapporté.

(3) Aux Etats-Unis en particulier.

Mais cet éceuil d'autant plus acilement évité que nous ne nous rappellons pas l'avoir vu en pratique, n'est-il pas mieux de n'avoir qu'une seule Centrale? Ne donnons-nous pas plus de cohésion à un mouvement? Ne pouvons-nous pas mieux déclancher une offensfive générale? Et dans la mise en commun des forces, il y a des échanges, des prêts à faire qui souvent parfois un faux pas a une branche peu vigoureuse de produits. Nous posons simplement la question.

LA DIRECTION.

Association de cultivateurs, la coopérative doit être dirigée par ces membres ou ceux a qui elle délègue son pouvoir. Cela veut dire que nous techniciens, devons nous en désinteresser, Quand on tient une lampe en mains, allons, faût-il aller la cacher sous un boisseau? Et nous n'aurions pas notre raison d'être, nous les propagandistes, inspecteurs ou instructeurs en coopération. Autant voudrait disparaître de la scène. Et la somme d'ouvrage qui nous arrive de toutes parts nous montre bien que si nos cultivateurs aiment à mener eux-mêmes leur association, ils ne se font pas faute de demander conseil, appui et soutien pour vaincre les difficultés qui se rencontrent sur la route.

Ah! mais il faut y aller doucement. Et que jamais cette direction ne se rapproche de près ou de loin de quelque chose qui ressemblerait à un commandement. Il n'en faut pas moins pour qu'elle soit acceptée. A nous de savoir nous y rendre. A nous de mettre un peu de nos aptitudes personnelles. Nous n'avons pas de conseils à donner là-dessus mais soyons bien convaincu que même la légitime satisfaction d'une science acquise au prix des plus laborieuses études, si elle se montre trop ne réussira en rien aupres du cultivateur.

CONCLUSIONS.

Forcement nous avons dû être superficiels. Chaque item de ce trop courte esquisse demanderait une étude approondie. Nous n'en n'avons ni l'espace ni le temps. Mais nous serons le plus heureux des humains si nous avons fait germer ou simplement raffermi chez quelque lecteur l'idée que le succès de toute coopération de vente est étroitement lié aux pricipes que nous poserons à la base.

Heureux encore plus si quelque bonne volonté en mal de se dévouer décidait à la suite de se consacrer à la diffusions des idées coopératives.

C'est là l'humble ambition qui nous a fait prendre la plume et nous la fera tenir aussi longtemps qu'il le faudra.

HOMMAGES AUX CULTIVATEURS

Toutes nos manifestations si importantes soient-elles ne serviraient à rien si là-bas le paysan, penché sur son sillon, n'accomplissait, par tous les temps, son dur labeur journalier. Ne l'oublions pas, l'agriculture reste la base la plus solide de notre situation économique. Le relèvement de la France victorieuse, mais meurtrie dépend en bonne partie de l'homme des champs. C'est lui qui, après avoir gagné la guerre, effacera par de nouvelles et flourissantes cultures la trace douloureuse des tranchées.

GUILLON

L'AME PAYSANNE

L'âme paysanne est une réalité spirituelle très profonde et très belle: elle flotte sur les labours à la chanson traînante du bouvier et parmi les rires Dionysiaques des vendangeurs barbouillés du jus de grappes; pastorale dans la prairie, bûcheronne dans la forêt, elle salue chaque matin l'aube naissante avec le premier appel de l'alouette dans les airs, et chaque soir s'endort au bercement abscur de rêves millénaires. C'est une des grandes réserves où s'économise et se conserve de la force vive, de la force vierge, pour la pensée française, pour nos artistes, nos écrivains et nos philosophes. Qui pourrait se désintéresser de sa souffrance? Et puis que de gens, par le sort enfermés dans les villes et ne distinguant plus le blé de l'avoine avant l'épiaison, gardent au fond du coeur le souvenir ensoleillé de quelque champ ancestral.

E. LABAT